Personalized E-Learning System with Self-Regulated Learning Assisted Mechanisms for Promoting Learning Performance

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Abstract
The self-regulated learning is a goal-oriented learning strategy and it is very suitable to be applied in self-management learning for promoting learning performance of individual learner in a web-based learning environment. This study proposes a personalized e-learning system with self-regulated learning assisted mechanisms to help learners promote their self-regulated learning abilities. The proposed self-regulated learning mechanisms aim at guiding learners to become as lifelong learners who own autonomous self-regulated learning abilities.

Keywords: Web-based learning, Self-regulated learning, Personalized learning

1. Introduction
Many researches have indicated a significant positive correlation between academic achievement and self-regulated learning ability among students in different academic stages [1-2]. Many studies also indicated that low self-regulating students are not as academically successful as high self-regulating students [3]. In other words, the self-regulated learning ability of individual learner is obviously an important factor affecting the learning performance in a web-based learning environment.

This study aims to develop effective self-regulated learning assisted mechanisms on the personalized e-learning system in order to cultivate learners’ self-regulated learning abilities for promoting learning performance.

2. The Proposed Self-Regulated Learning Assisted Mechanisms
2.1. System Design
The personalized e-learning system (PELS) based on the Item Response Theory [4], which includes an off-line courseware modeling process, four intelligent agents and four databases, is presented in our previous study for adaptive courseware recommendation [5]. In the study, the functionalities of the PELS system are extended to include the self-regulated learning assisted mechanisms in order to promote the spontaneous, autonomous and self-regulated learning abilities of learners. The proposed self-regulated learning competence indexes and learning performance indexes are detailed as follows:

(1) Self-regulated learning competence index
(a) Achievement index of learning time

\[ G_{\text{time}}(s) = \min \left[ \frac{S_{\text{time}}(s)}{U_{\text{time}}(s)} \right] \times 100 \]  

where \( G_{\text{time}}(s) \) represents the achievement index of learning time, \( S_{\text{time}}(s) \) is the target learning time set by the \( s^{th} \) learner according to the self-regulated learning goal of individual learner, and \( U_{\text{time}}(s) \) is the actual learning time of the \( s^{th} \) learner.

(b) Achievement index of effort level of learning courseware

\[ L_{\text{effort}}(i) = \frac{1}{n} \times \sum_{i=1}^{n} \frac{c_{\text{time}}}{l_{\text{time}}(i)} \times 100 \]  

where \( L_{\text{effort}}(i) \) represents the achievement index of effort level of learning courseware, \( c_{\text{time}} \) is the minimum required learning time of the \( i^{th} \) courseware set by course teacher, \( l_{\text{time}}(i) \) is the actual learning time of the \( i^{th} \) courseware of the \( s^{th} \) learner, \( n \) is the total number of learned courseware, and \( m \) is an adjustable constant determined by course teacher.

(c) Achievement index of reading rate

\[ R_{\text{rate}}(s) = \frac{R_{\text{course}}(s)}{S_{\text{course}}(s)} \times 100 \]  

where \( R_{\text{rate}}(s) \) represents the achievement index of reading rate, \( R_{\text{course}}(s) \) is the target amount of reading courseware set by the \( s^{th} \) learner, and \( S_{\text{course}}(s) \) is the actual amount of reading courseware of the \( s^{th} \) learner during a learning process.
(d) Achievement index of concentrated learning

\[ L_{\text{con}}(S) = \frac{R_{\text{time}}(s)}{T_{\text{time}}(s)} \times 100 \]  

(4)

where \( L_{\text{con}}(S) \) represents the achievement index of concentrated learning, \( R_{\text{time}}(s) \) is the totally valid learning time of the \( s^{\text{th}} \) learner, and \( T_{\text{time}}(s) \) is the totally learning time of the \( s^{\text{th}} \) learner.

(2) Self-regulated learning performance index

After learning the recommendation courseware, the personalized e-learning system [5] can dynamically estimate the learner’s ability according to the Item Response Theory by collecting the replied responses of the learner to the randomly selected testing questions in the learned course unit.

2.2. The Implemented Personalized E-learning System with Self-Regulated Learning Assisted Mechanisms

The proposed self-regulated learning assisted mechanisms will direct a learner to fill a self-monitor form before progressing courseware learning. The filled data fields contain the target learning time, target number of learned courseware, target effort level of learning courseware, target concentrated study degree of learning courseware, and target achievement index of learner ability. Figure 1 shows the self-monitor form that each learner has to fill out.

![Figure 1. The self-monitor form filled by learner](image)

After filling the form, the system will guide the learner to enter the interface of courseware learning shown as Fig. 2. In the figure, the left-up frame reveals the immediate messages including the total learning time, valid learning time and login information. The left-middle frame displays immediately the radar plot with five-dimension self-regulated learning indicators including four proposed self-regulated competence learning indexes and one learning performance index. This frame also shows the hint message from teacher through the hint message module. The middle-up frame exhibits the interactive animation courseware designed by Macromedia flash and the middle-down frame shows the corresponding quiz for the learned courseware. Finally, the right frame shows a fast function menu for quickly linking to the functions of performing self-monitor, self-inspection, self-evaluation, and Q & A.

![Figure 2. The layout of courseware learning interface](image)

3. Conclusion

This study presents a personalized e-learning system with self-regulated learning assisted mechanisms, which can promote self-regulated learning abilities of individual learners, to support learning performance promotion of individual learner. The proposed self-regulated learning assisted mechanisms efficiently helps learners in self-examining and self-evaluating their learning goals and performances via the immediately displaying self-regulated learning radar plot with five-dimension self-regulated learning indicators during learning processes.

References


